Pre processing Star Analyser spectra taken with a DSLR using IRIS software (based on v5.57)

Taking the spectrum

To minimise in camera artifacts, use the camera's RAW image mode

The individual pixels in colour camera are sensitive to particular colours (red, green, blue) This means that in different parts of the spectrum image some pixels are insensitive. This can cause artifacts in the spectrum, particularly if it has to be rotated during processing. To minimise this effect

Make sure the spectrum is as horizontal as possible
Make sure the spectrum contains data from several (at least 10) rows of pixels by either
Allowing the star to drift vertically during the exposure or
Taking a series of short exposures, moving the scope slightly between each image and align and stack the separate images.

Setting up IRIS

Set up the working directory in "file", "settings" (This is where IRIS will look for files and store results by default) Set the file type to "fit"

Set your camera model by clicking the camera icon and selecting from the drop down list. (This ensures the raw images are decoded correctly with the right colour assigned to each pixel)

Decoding the RAW image

Note the following procedure will remove the unwanted colour information. If you want to view your raw image in colour beforehand, you can do this using "file" "load" and select file type "photo"

To decode the raw image, select "digital photo" "decode raw files" and drag and drop your RAW spectrum image into the new window. Enter a name for your converted file and click "B+W". Click "done" and the converted image will be displayed and stored as a fit file in the working directory. (You can also convert batches of spectra in one go using this function)

Applying darks and flat corrections

Darks and flats are converted in the same way and used to correct the spectrum images at this stage. This can be done in IRIS or other programs. I use the program ImageTOOLSca

Correcting the geometry of the spectrum.

If the spectrum is tilted from the horizontal, or the spectral features are slanted from the vertical because the drift direction was not exactly 90 deg to the spectrum then this

needs to be corrected. Note these corrections change the length of the profile and therefore the dispersion (A/pixel). If you are using a standard star for wavelength calibration, exactly the same corrections must also be applied to this.

Measure the tilt and slant of the spectrum in degrees. This can be done in IRIS but I measure them using the aligning and stacking program K3CCDtools

Select "spectra" "tilt of a 2D spectra" and enter the horizontal position where the tilt will be applied around (I normally use 0) and the angle (-ve is clockwise) and click OK. The spectrum should now be horizontal

Select "spectro" "slant of a 2D spectra" and enter the vertical position where the tilt will be applied around (normally approximately where the spectrum is located but use the same figure for a set of spectra which are going to be aligned and stacked) Enter the angle (+ve is clockwise) and click OK. The spectrum features should now be vertical.

Removing the sky background

This is a critical step for producing accurate spectra as it sets the zero point along the length of the spectrum. Select "spectro" "remove the sky to a 2D spectra". I normally use "median" to calculate the background but if you have a significant vertical gradient, linear or parabolic may describe the background better. Click ok and select 4 points on the image to define the two horizontal bands (two points either side of the spectrum) where you want the background to be measured (The bands should be close to the spectrum but check that none of the spectrum signal is included by adjusting the thresholds.) After the 4th point has been selected the background will be subtracted.

Note the geometric corrections and sky background removal can also be made on batches of spectra

Saving the result

If you are going to do further processing using Visual Spec I recommend saving the result as a pic file (Note this is a special file type used by IRIS and has good compatibility with Visual Spec) Otherwise save as a fit file.

Multiple spectra can be aligned (on the zero order or a spectrum feature) and stacked IRIS to produce a single result in but I use K3CCDTools.